<u>**In the Claims**</u>

Claims 1-30 – (Cancelled)

31. (New) A method of imaging large volumes without resulting slab-boundary artifacts comprising:

defining a desired FOV larger than an optimal imaging volume of an MR scanner;

selecting a slab thickness in a first direction that is smaller than the desired FOV and within the optimal imaging volume of the MR scanner; and

continuously moving one of the optimal imaging volume and an imaging object in the first direction while repeatedly exciting and encoding spins with readout in the first direction to acquire MR data that is restricted to the selected slab thickness until at least one image of the FOV can be reconstructed;

processing the MR data to account for accrued phase resulting from table velocity;

transforming the MR data in a z-direction;

correcting the MR data for spatial variations in the magnetic field in the direction of motion;

removing unnecessary data at the beginning and ending of each acquisition; and

sorting, interpolating, and aligning the transformed MR data to match anatomic locations in the first direction.

32. (New) The method of claim 31 further comprising reconstructing an MR image by transforming the z-transformed MR data in remaining transverse dimension(s).

33. (New) The method of claim further comprising gridding the z-transformed MR data in dimension(s) perpendicular to the first direction to reconstruct an MR image.

34. (New) The method of claim 31 further comprising the step of using additional MR data to track motion of one of the optimal imaging volume and an imaging object.

35. (New) The method of claim 31 further comprising reconstructing the acquired data to form at least one of a 2D image and a 3D image.

36. (New) The method of claim 31 further comprising the step of using a portion of the acquired MR data to track motion of one of the optimal imaging volume and an imaging object.

37. (New) The method of claim 31 wherein the step of exciting and encoding spins is further defined as restricting data acquisition by encoding and filtering data so as to acquire data that is limited to the selected slab thickness.

38. (New) The method of claim 31 wherein the step of exciting and encoding spins is further defined as restricting excitation in at least one direction other than the first direction.

39. (New) The method of claim 31 wherein the first direction is defined as a z-direction.

40. (New) The method of claim 31 wherein each MR data acquisition during continuous movement includes acquiring all k-space data in a direction of motion of a patient table for a selected subset of transverse k-space data.

41. (New) The method of claim 31 further comprising reducing exam time by imaging during table motion.

42. (New) The method of claim 31 further comprising processing the MR data using a gridding reconstruction.

43. (New) The method of claim 31 further comprising the step of maintaining a position of slab thickness fixed relative to a magnet of the MR scanner during imaging of the desired FOV and the continuous moving of one of the optimal imaging volume and the imaging object.

44. (New) The method of claim 31 further comprising applying gradient waveforms on an axis parallel to the first direction while acquiring imaging data.

45. (New) An MR apparatus to acquire multiple sets of MR data with a moving table and reconstruct MR images without slab boundary artifacts comprising:

a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images;

a patient table movable fore and aft in the MRI system about the magnet bore; and

a computer programmed to:

receive input defining a desired FOV larger than an optimal imaging volume of the scanner;

position the patient table at a location superior or inferior to the desired FOV;

accelerate the patient table to a desired constant velocity before a leading edge of the desired FOV reaches a slab fixed in position with respect to the magnet;

acquire full MR data with readout in a direction of table motion;

continuously move the patient table at the desired constant velocity while maintaining position of the fixed slab; and

repeat acquisition of full MR data for a number of table positions while the patient table is moving until an MR data set is acquired across the desired FOV to reconstruct an image of the FOV.

46. (New) The MRI apparatus of claim 45 wherein the computer is further programmed to cause transmission of magnetic gradient waveforms to encode a k-space trajectory that is uniform in k_z.

47. (New) The MRI apparatus of claim 45 wherein the computer is further programmed to:

transform MR data with respect to z;

align the z-transformed MR data to match anatomy across slab boundaries; and

transform the z-transformed MR data with respect to at least one remaining dimension to reconstruct an MR image.

48. (New) The MRI apparatus of claim 45 wherein the computer is further programmed to:

apply an RF pulse to excite a volume-of-interest;

apply a k-space trajectory to encode the volume-of-interest; and

filter the acquired MR data to restrict the MR data to the defined fixed slab.

49. (New) The MRI apparatus of claim 45 wherein the computer is further programmed to:

acquire all k_z data for a selected subset of transverse k-space data;

define a set of magnetic field gradient waveforms to incrementally encode and acquire data in a given slab; and

apply the set of magnetic field gradient waveforms in a cyclic order.

50. (New) A computer program to control a medical image scanner and create images across scanning boundaries without boundary artifacts, the computer program having a set of instructions to control a computer to:

select an FOV spanning an area greater than a predefined optimal imaging area of a medical image scanner;

determine a constant velocity by which to continuously translate a patient table about a magnet bore of the medical image scanner;

position the patient table at a location inferior or superior to the desired FOV;

accelerate the patient table to the constant velocity before a leading edge of the FOV reaches a slab fixed in position with respect to a magnet of the medical image device;

play out RF and gradient waveforms during patient table acceleration to establish steady-state in the FOV;

acquire full MR data with readout in a direction of table motion;

continuously move the patient table at the desired constant velocity while maintaining position of the fixed slab; and

repeat acquisition of full MR data for a number of table positions while the patient table is moving until an MR data set is acquired across the desired FOV to reconstruct an image of the FOV.